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CONTENTS

Original Communications PAGE

(1) Dental Caries and Length of Institutional Residence; (2) Relationship between Dental Caries and Calculus; (3) Dental Caries and the pH of Saliva. By H. H. STONES, M.D., M.D.S., F.D.S. R.C.S., F. E. LAWTON, B.D.S., F.D.S. R.C.S., E. R. BRANSBY, PH.D., and H. O. HARTLEY, PH.D. 199

The Identity of Tomes' Fibre. By ERIC W. BRADFORD, M.D.S.SHEFF. 203

Short Communication

Abnormal Upper Centrals. By J. W. LOWE 209

Demonstration at Annual Meeting

Malocclusion: Its Ætiology and Principles of Treatment. By DOUGLAS MUNNS, L.D.S.Eng. 209

Editorial

The New Zealand Report 211

Notes and Comments PAGE

The Proposed General Dental Services Committee 212

Presentation Portrait of Dr. Lindsay .. 213

Presentation to Mr. Lionel Balding 213

Letter to the Editor

Presentation Portrait of Dr. Lindsay (H. T. Roper-Hall (*President*), E. B. Dowsett, W. Kelsey Fry, Thomas Hindle, A. P. Husband, J. Lauer, W. R. Tattersall, Bryan J. Wood (*Chairman of the Committee*) .. 213

Metropolitan Branch Study Circle 213

Candidates for Membership 213

Our Diary 214

Forthcoming Meetings at Headquarters 214

British Dental Association 214

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BRITISH DENTAL JOURNAL

The Journal of the British Dental Association

VOL. LXXXIX NOVEMBER 7, 1950 No. 9

ORIGINAL COMMUNICATIONS

1. DENTAL CARIES AND LENGTH OF INSTITUTIONAL RESIDENCE
2. RELATIONSHIP BETWEEN DENTAL CARIES AND CALCULUS
3. DENTAL CARIES AND THE pH OF SALIVA

BY H. H. STONES, M.D., M.D.S., F.D.S. R.C.S., F. E. LAWTON, B.D.S., F.D.S. R.C.S., E. R. BRANSBY, PH.D., and H. O. HARTLEY, PH.D.

(*a*) *Introduction.*—In September 1942 a survey was started on the condition of the teeth of about 280 children living at the National Children's Home, Frodsham. There were both boys and girls at the Home aged between 3 and 16 years. A report on one part of this survey, namely, the effect of fluorine on the incidence of caries, has already been made (Stones, Lawton, Bransby and Hartley, 1949).

In the present paper are presented the following three sets of results obtained in the main from data collected in September 1942 :

(1) Caries incidence and its relation to length of institutional residence.
(2) The relationship between the incidence of caries and that of calculus.
(3) The relationship between the incidence of caries and pH of the saliva.

The dental information required for these analyses was recorded as follows :

(*b*) *Measure of Caries Intensity.*—Caries intensity was recorded for each tooth as 0, 1, 2 or 3 in accordance with the examiner's estimation of its extent :

0. Tooth free from caries.
1. One or more cavities in the same tooth detectable by sharp probe or bite-wing radiograph, where the lesion had not penetrated through the enamel to involve the dentine.
2. One or more cavities in the same tooth where the dentine was involved, but where a total of less than a quarter of the crown was estimated to have been destroyed.
3. One or more cavities in the same tooth resulting in a total destruction of more than a quarter of the crown.

(*c*) *Measure of Calculus Intensity.*—Calculus was recorded for each tooth as 0, 1, 2 or 3, the estimation being on the following basis :

0. Tooth free from calculus.
1. Tooth having the least detectable amount of calculus.
2. Tooth carrying an easily recognised amount.
3. Tooth with heavy deposits.

Stains that were not apparently associated with the presence of detectable solid deposits were disregarded.

(*d*) *Length of Time Spent in a Home and Age of Teeth.*—The amount of time spent in a Home related not only to the time spent at Frodsham, but also the time spent previously at any similar Home. In assessing the effect of the length of institutional residence on the incidence of caries, account was taken in the analysis of the average ages of the teeth since eruption. Since the actual ages of the eruption of the teeth of the various children were not known the following average times of eruption were used.

(1) *Deciduous Dentition*

(*a*)	First incisors	8 months after birth
(*b*)	Second „	10 „ „ „
(*c*)	Canines	18 „ „ „
(*d*)	First molars	12 „ „ „
(*e*)	Second „	24 „ „ „

(2) *Permanent Dentition*

(*a*)	First incisors	7 years
(*b*)	Second „	8 „
(*c*)	Canines	11 „
(*d*)	First premolars	10 „
(*e*)	Second „	11 „
(*f*)	First molars	6 „
(*g*)	Second „	12 „

This information was combined with the age of the child at the date of examination and from it was obtained the estimated age of each teeth-group to the nearest month. The following is an example of the method for this :

From the child's chart { Date of birth —3.3.31
„ „ exam.—2.9.42

Age 138 months

From the table given above. Average age of eruption of teeth in group $\frac{ed \mid de}{ed \mid de}$ = 18 months

i.e. average of 12 and 24 months

Result. Average age of teeth in group $\frac{ed \mid de}{ed \mid de}$ at time of examination = 138 − 18 = 120 months.

(*e*) *The Incidence of Caries.*—The following data on the incidence of caries are presented to indicate the condition of the teeth of the children at the time when the present investigations were made. In view of the difficulty of interpreting the data on mixed dentitions, information relating to caries is given in this section only for : (1) deciduous teeth of children of 6 years and under, and (2) permanent teeth of children of 9 years and over. It should, however, be noted that the caries incidence on teeth other than these was used in the studies described below.

Tables IA and IB give the DMF and average

TABLE IA: INCIDENCE OF CARIES IN DECIDUOUS TEETH

		All deciduous teeth	
		Boys	*Girls*
Number of children under 6 years	...	8·0	15·0
D.M.F. Average	... ...	4·6	5·1
D.M.F. Standard error	...	1·4	1·2
Total caries score Average	... ...	9·8	11·1
Total caries score Standard error	...	3·1	2·7

TABLE IB: INCIDENCE OF CARIES ON PERMANENT TEETH

		All permanent teeth	
		Boys	*Girls*
Number of children 9 years and over	...	106·0	69·0
D.M.F. Average	... ...	2·0	2·4
D.M.F. Standard error	...	0·21	0·26
Total caries score Average	... ...	3·2	3·6
Total caries score Standard error	...	0·39	0·48

caries score for these groups. It must be noted that in the examination from which the data were obtained, a missing tooth was given a score of 3 and the filled teeth were included in the score. For the children of 6 years and under there is no significant difference between the values for boys and girls, the average number of DMF teeth being 4·9 and the average caries score being 10·5. For the permanent teeth of children aged 9 years or more there is again no significant difference in the caries scores between boys and girls. For the whole group the average DMF is low at about 2·2 and the average score is 3·4.

(1) THE RELATIONSHIP BETWEEN THE INCIDENCE OF DENTAL CARIES AND THE LENGTH OF INSTITUTIONAL RESIDENCE

Since this investigation was commenced, Knowles (1948) has made a survey and reported that children living in residential nurseries have better teeth than have children attending day nurseries and living at home and that the caries incidence of residential nursery children decreases in proportion to the length of stay. The ages varied from 3–6 years and her investigation therefore applied to the deciduous teeth only. In America Hadjimarkos and Storvick (1949) have recorded that the caries attack rate of the permanent teeth of children aged 6–16 years living in an institution was considerably lower than that of school children.

As the incidence of caries is affected both by age and the length of stay in a Home, and as there is a close association between these two factors, the appropriate statistical procedures were adopted in the present investigation to assess the effect of each of these factors separately. The two groups of teeth considered were the deciduous molars (de) for children in the age range 4–8 years and the first permanent molars (6) for children aged 9–13 years.

Table IIA gives the average caries scores of the teeth groups $\frac{ed \mid de}{ed \mid de}$ according to sex, age and length of the stay in a Home and Table IIIA gives the correlation coefficients between the average caries score and the length of time spent in a Home for the teeth groups $\underline{cba} \mid \underline{abc}$ and $\frac{ed \mid de}{ed \mid de}$ for the two age-groups 4–7 years and 8 years. Table IIA shows an obvious increase in caries

TABLE IIA.—CARIES SCORES ON TEETH GROUP $\frac{ed \mid de}{ed \mid de}$ CLASSIFIED BY AGE AND LENGTH OF INSTITUTIONAL RESIDENCE

		Number of years spent at a Home			
		Boys		*Girls*	
Age—Years		2 or less	3 or more	2 or less	3 or more
4–7	Score	9·2	8·2	6·9	8·1
	Number	9	5	11	7
8	Score	15·4	8·2	11·6	18·2
	Number	8	15	7	6

incidence with age, but an inconsistent result for the effect of institutional residence. Similarly the correlation coefficients given in Table IIIA are small, though the signs for six out of eight are negative, suggestive that residence in a Home is beneficial to the incidence of caries.

Table IIB shows the caries incidence for the first permanent molars $\frac{6 \mid 6}{6 \mid 6}$ according to sex, age

TABLE IIB.—CARIES SCORE ON TEETH GROUP $\frac{6|6}{6|6}$ CLASSIFIED BY AGE AND LENGTH OF INSTITUTIONAL RESIDENCE

		Number of years spent at a Home					
		Boys			*Girls*		
Age—Years		3 or less	4–6	7 or more	3 or less	4–6	7 or more
9	Score	2·5	1·4	0·7	0·3	1·0	0
	Number	2	9	3	3	3	2
10	Score	1·9	2·4	0·3	0·8	1·0	0·5
	Number	10	7	7	4	4	2
11	Score	3·3	0·9	1·0	4·5	3·0	3·7
	Number	4	9	4	2	5	4
12	Score	6·0	3·8	2·8	3·2	2·4	2·0
	Number	1	12	9	4	9	4
13+	Score	4·4	5·0	2·1	4·8	5·7	0·8
	Number	8	8	13	5	12	6

"Average standard error" = 0·63.

and length of stay in a Home and Table IIIB the correlation coefficients between caries incidence for these teeth and the length of stay for each yearly age-group in the age range 9–13 years.

TABLE IIIA.—CORRELATION COEFFICIENTS BETWEEN CARIES INTENSITY AND NUMBER OF MONTHS SPENT AT A HOME

Group $\frac{cba|abc}{}$

	Boys		*Girls*	
Age-group	*No. of children*	*Correlation coefficients*	*No. of children*	*Correlation coefficients*
4–7 yrs.	15	−0·03	20	−0·06
8 „	23	−0·04	14	+0·08

Group $\frac{ed|de}{ed|de}$

4–7 yrs.	15	−0·12	20	−0·31
8 „	23	−0·23	14	+0·10

TABLE IIIB.—CORRELATION COEFFICIENTS BETWEEN AVERAGE CARIES INTENSITIES AND THE NUMBER OF YEARS SPENT AT A HOME, FOR INDIVIDUAL AGE-GROUPS

Group $\frac{6|6}{6|6}$

	Boys		*Girls*	
Age-group	*No.*	*Correlation*	*No.*	*Correlation*
9 years	14	−0·251	18	−0·249
10 „	25	−0·112		
11 „	17	−0·362	12	−0·408
12 „	22	−0·266	17	−0·498*
13+ „	29	−0·454*	23	−0·067

* indicates statistical significance.

Table IIB shows that the incidence of caries increases with age and decreases with the length of stay in a Home, particularly for the boys. This latter point is substantiated by Table IIIB for the signs of all the correlation coefficients are negative. When the results for the various age-groups are combined, the average correlation coefficients are −0·30 for boys and −0·29 for girls, both of which are significant.

These results show that residence in the Home has a beneficial effect on the incidence of caries on permanent teeth. This finding is similar to that of Knowles (1948) for deciduous teeth.

(2) Relationship Between the Incidence of Dental Caries and Calculus

The object of this study was to ascertain if there was any association between the incidence of caries and that of calculus. The problem could be approached in two ways. First, comparing the changes in caries and calculus on the same teeth over a period ; second, by examining the relationship between caries and calculus in the mouths of different children at any one time. A complicating difficulty in such a study is that caries and calculus occur principally in different groups of teeth. The main calculus deposition occurs on the lingual surface of the mandibular incisors (it also occurs on the buccal surface of the maxillary molars but not to the same extent, especially among children). On the other hand, caries on the mandibular incisors is rare. It was therefore decided to examine the relationship between the incidence of caries and calculus, on the teeth on which they most commonly occur, namely, calculus on $\overline{cba|abc}$ and $\overline{321|123}$ and caries in $\underline{cba|abc}$, $\frac{ed|de}{ed|de}$ and $\frac{6|6}{6|6}$. A possible criticism of this method of investigation may arise from the fact that carious teeth tend to be shed sooner than non-carious teeth. The caries score in the carious mouths will thus tend to be reduced. If there is an association between the incidence of calculus and of caries, the teeth with high calculus values may persist in the mouth while those with high caries values may tend to be shed early. The association thus found between caries and calculus may not, in fact, represent the true state of affairs. The point should, however, be stressed that what was examined in this study was the relationship between the incidence of caries and calculus on different groups of teeth and not their incidence on the same teeth. Average calculus scores were calculated for the groups $\overline{cba|abc}$ and $\overline{321|123}$ and the means of these were related with the average caries scores for the teeth $\underline{cba|abc}$ $\frac{ed|de}{ed|de}$ and $\frac{6|6}{6|6}$.

Table IV shows the average calculus scores for boys and girls of different ages. The scores for boys are fairly consistently higher than those for girls. Those for girls increase substantially with age, but the increase is not marked for boys.

Tables VA and B give the caries incidence on teeth groups $\frac{ed|de}{ed|de}$ and $\frac{6|6}{6|6}$ of children of

TABLE IV.—AVERAGE CALCULUS SCORES FOR BOYS AND GIRLS ACCORDING TO AGE

	Boys		Girls	
Age-Years	*Average*	*Standard error*	*Average*	*Standard error*
4–7	0·14	0·07	0·16	0·07
8	0·34	0·10	0·17	0·08
9	0·38	0·16	0·31	0·07
10	0·42	0·10	0·35	0·15
11	0·51	0·14	0·36	0·09
12	0·59	0·08	0·53	0·16
13–14	0·64	0·09	0·69	0·19

TABLE VA.—ASSOCIATION BETWEEN CARIES AND CALCULUS*

Caries Score for the Teeth Group $\frac{ed \mid de}{ed \mid de}$

Age-Years		*Low calculus**	*High calculus**
	Boys		
4–8	Caries score	0·67	1·03
	Standard error ...	0·18	0·23
	No.	23	14
9–11	Caries score	0·70	0·81
	Standard error ...	0·18	0·18
	No.	23	23
	Girls		
4–8	Caries score	0·98	0·76
	Standard error ...	0·17	0·28
	No.	23	8
9–11	Caries score	0·87	1·10
	Standard error ...	0·22	0·30
	No.	13	7

*Average calculus score for the groups $\overline{cba \mid abc}$ and $\overline{321 \mid 123}$.

TABLE VB

Caries Score for the Teeth Group $\frac{6 \mid 6}{6 \mid 6}$

Age-Years		*Low calculus**	*High calculus**
	Boys		
9–11	Caries	0·33	0·19
	Standard error ...	0·09	0·10
	No.	29	26
12–14	Caries	0·39	0·52
	Standard error ...	0·10	0·10
	No.	25	26
	Girls		
9–11	Caries	0·32	0·23
	Standard error ...	0·12	0·14
	No.	17	12
12–14	Caries	0·42	0·39
	Standard error ...	0·11	0·11
	No.	20	20

*Average calculus score for the groups $\overline{cba \mid abc}$ and $\overline{321 \mid 123}$.

specific age ranges classified according to whether their calculus values on $\overline{cba \mid abc}$ and $\overline{123 \mid 321}$ were lower or higher than the average values. There is a tendency for the deciduous molars (de) (Table VA) to have a greater caries intensity in the presence of high calculus but none of the differences is statistically significant. On the other hand, there is a tendency for the permanent molars (6) (Table VB) to have a greater caries incidence in the presence of little calculus, although again the differences are not statistically significant.

Table VI gives the correlation coefficients between the incidence of caries and the incidence

TABLE VI.—CORRELATION COEFFICIENTS BETWEEN AVERAGE CARIES SCORES AND AVERAGE CALCULUS SCORES

	Boys		Girls	
Age-Years	*No. of children*	*Correlation*	*No. of children*	*Correlation*
4–7	15	+0·31	20	+0·07
8	22	−0·17	14	−0·12
9	14	−0·41	18	−0·03
10	25	+0·25		
11	17	−0·42	12	−0·20
12	22	−0·12	17	−0·05
13–14	20	+0·16	13	+0·34
			10	−0·35

of calculus for yearly age-groups except for the group 4–7 years. None of the correlation coefficients taken singly is significant and the signs are inconsistent.

The conclusion to be drawn from these analyses is that there appears to be little, if any, association between the incidence of caries in the mouth and the incidence of calculus in the mouth, as measured by their incidence on different groups of teeth. Nothing can be said about their relationship on the same teeth.

(3) Association Between Dental Caries and the pH of the Saliva

The pH of pooled resting saliva has been measured by various workers. Among the more recent determinations are those of Grossman and Brickman (1937) who state that the average value lies betwen pH 6·5 and 6·9 and Stephan (1944) who estimates it to be between pH 6·0 and 7·4.

Several attempts have been made to find a correlation between the pH of saliva and caries experience. Krasnow and Krejci (1931) using colorimetric methods with bromthymol blue as the indicator report the average values of resting saliva from caries immunes to be pH 7·03 ± 0·15, and from susceptibles pH 6·90 ± 0·12 and that this difference is not statistically significant. Swendlove (1942), repeating their experiments, again has found no significant relationship between pH and caries incidence. Stephan (1944), using an antimony electrode directly in the floor of the mouth, reports a much wider variation from an average of pH 7·0 in caries free groups to an average of pH 6·4 in an extremely active group.

Method.—About 5 c.c. of unstimulated mixed saliva was collected in a wide-necked bottle fitted with a rubber diaphragm and screw top, from each child at 9 a.m., 11 a.m., 1 p.m. and 3 p.m. on the same day. The children were together in groups of 10 in a room on each occasion when saliva samples were obtained. The pH of each sample was measured within a few minutes of its collection using a Stadie type

glass electrode and a Cambridge electric pH meter. The average of the four determinations was used.

Schmidt-Neilson (1946) has shown that resting saliva is obtainable only with the subject passive and at complete rest, and that any stimulation such as coughing, talking, etc., causes an immediate rise in pH. Since it is obviously impossible to have a number of young children together in a room without their talking and laughing, the pH values obtained may be a little high. The collections were, however, all made under identical conditions with regard to meal times and prior exercise so that the results should be comparable from child to child.

Results.—Table VII shows the average pH values for boys and girls according to age. In

TABLE VII.—AVERAGE pH VALUES BY AGE AND SEX

	Boys			*Girls*		
Age-Years	*No.*	*Average*	*St. error*	*No.*	*Average*	*St. error*
4–7	15	7·19	0·03	20	7·18	0·03
8	22	7·22	0·04	14	7·14	0·05
9	14	7·24	0·03	18	7·11	0·03
10	25	7·21	0·02			
11	17	7·18	0·03	12	7·03	0·05
12	22	7·09	0·04	17	6·96	0·04
13–14	29	7·05	0·05	23	6·98	0·03

each group the values for boys are slightly higher than those for girls. For both sexes the values tend to fall with increasing age during the span 9–14 years. The above are for group values. There are, of course, marked individual variations.

The partial correlation coefficient between the incidence of caries and the pH of the saliva (that is, after the effect of age had been eliminated by calculating the partial correlation coefficient with the length of stay in the Homes held constant) is —0·09 for boys and —0·16 for girls. Neither is significant. Combining the partial correlations for boys and girls there is a slight indication of a negative association between incidence of caries and pH of saliva, but this is only on the borderline of statistical significance.

Summary

A survey was made in September 1942 of the dental condition of about 280 children aged between 3 and 16 years living at the National Children's Home, Frodsham. From the data collected an examination was made of the relationship between the incidence of (1) dental caries and the length of institutional residence ; (2) dental caries and calculus ; and (3) dental caries and the pH of the saliva. It was found:

(1) That residence in the Home had a beneficial effect on the incidence of caries in permanent teeth, and possibly on deciduous teeth.

(2) There was no association between the incidence of caries and calculus on different groups of teeth.

(3) There was no significant correlation either for boys or girls between the incidence of caries and the pH of the saliva, but when the correlation coefficients of boys and girls were combined, a negative correlation was on the borderline of signifiance.

Acknowledgments

The writers wish to express their gratitude to Mr. J. P. Bibby and Messrs. J. Bibby & Sons for their generosity in providing financial assistance to make this investigation possible, and to the Medical Research Council for a grant to complete the work of computation of the data. They also wish to record their appreciation of the assistance and co-operation given by Mr. S. S. Snell, the governor, and also by the staff of the Frodsham Branch of the National Children's Home. The pH estimations were carried out by Mr. A. C. Beeby.

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THE IDENTITY OF TOMES' FIBRE

By ERIC W. BRADFORD, M.D.S.Sheff.

Demonstrator and Research Assistant in the Department of Oral Anatomy and Physiology, University of Sheffield.

The teaching of the histology of dentine is rendered extremely difficult by the realisation that detailed knowledge of the tissue is very slight. The various textbooks put forward the theories which their authors believe to be correct, but which vary greatly from each other. The present work was undertaken with a view to combining and explaining some of these theories, by correlating them with observable phenomena.

The foundations of the histology of dentine were laid in the middle of the last century, prior to which, dentine was known to consist of a calcified matrix, traversed by a number of tubules. The first real advance was made by Tomes, J. (1852), who described long filamentous processes, apparently of the odontoblasts, which occupied these tubules. He noted at the same time that these fibres were of considerable strength, and that they protruded from the fractured surface of the dentine like rigid pipe stems, and that they could be stretched considerably without fracturing during the preparation of decalcified specimens. The pulp tissue itself is very soft, and no satisfactory explanation has yet been advanced to account for the resistance to mechanical injury of these protoplasmic strands which rarely exceed 5 μ in diameter. Indeed, despite the amount of work carried out on such subjects as the innervation and permeability of dentine, our general knowledge of the tissue is little further advanced than it was 100 years ago.

It is important to note that the work on this aspect of the structure of dentine has led to no startling discovery, but has confirmed the findings of a large number of previous workers who have drawn conclusions which differed markedly from each other. None of these conclusions explained all the observable phenomena, partly because each worker incorporated only some of them. The literature on the subject is very varied and conflicting, and it is doubtful whether any attempt to assess the value of each contribution to the subject would lead to anything but confusion in the mind of the reader. This may be gathered from a perusal of the historical surveys of Hanazawa (1917) or of Churchill (1935). Reference to previous work will therefore be indicated in the text at points of agreement or disagreement.

One of the reasons for the disagreement between the various theories is a confusion of nomenclature. No worker appears to have been satisfied, in his own mind, that the structures seen in "decalcified" sections could be identified in "ground" sections, and vice versa. The evidence of ground sections has therefore been dismissed (Fleischmann 1905), and their appearance explained as due to optical effects produced by the thickness of the sections (Hanazawa 1917). These contentions are considered to be untenable as ground sections of dentine can be produced which will give a crisp image under oil immersion lenses. As the tissues in a ground section are in a state as close to that existing *in vivo* as present histological methods can be expected to furnish, the nomenclature used in this paper is given with reference to those structures which can be seen in a ground section of dentine at right angles to the path of Tomes' fibre. This type of section will in future be referred to as a transverse section of dentine, similarly, a longitudinal section of dentine refers to sections in the plane of Tomes' fibres.

Four structures can be identified in ground transverse sections of normal dentine:

(1) Tomes' fibre,
(2) The translucent area,
(3) The intertubular dentine matrix,
(4) The line of junction between the intertubular dentine matrix and the translucent area.

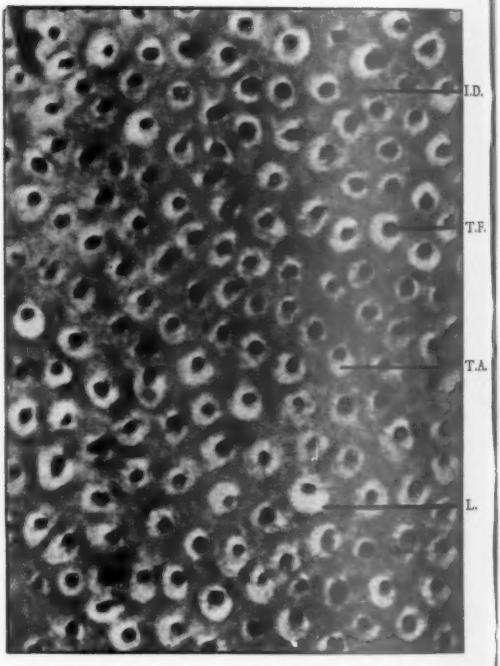

FIG. 1.—A ground T.S. of dentine stained with light green (Masson) to accentuate the difference between the translucent area and the intertubular dentine matrix. Mag. 1,200. T.F., Tomes' fibre; T.A., Translucent area; L., Line of junction; I.D., Intertubular dentine matrix.

It is not suggested at the present that each of these structures is a separate entity, but merely that they can be identified in ground section. It will be noted that such terms as "dentinal tubule," "odontoblast process," and "sheath of Neumann," have been eschewed. This is because these terms have never been satisfac-

torily defined with reference to a ground section, and a perusal of the literature shows that different workers have used these terms to describe totally different structures, with consequent confusion. One example may be cited in tabular form:

THE SHEATH OF NEUMANN, DEFINED BY HIM AS THE STRUCTURE ISOLATED BY THE HYDROLYSIS OF DENTINE

WORKERS WHO HAVE USED THIS TERM	STRUCTURE DENOTED ON THE ABOVE NOMENCLATURE
Hanazawa (1917)	Tomes' fibre
Walkhoff (1914)	Translucent area
Churchill (1935) Manley (1947)	The line of junction between the intertubular dentine and the translucent area

This question of the hydrolysis of dentine provides a good starting point for the investigation into the identity of Tomes' fibre. Römer (1899) Hanazawa (1917) and Churchill (1935) maintained that the structure isolated from dentine by hydrolysis of the matrix was identical with Tomes' fibre, whereas Walkhoff (1915), Fleischmann (1905), and Kantorowicz (1911) considered that the structure isolated by hydrolysis and Tomes' fibre were two different structures.

The hydrolysis of dentine can be considered as two separate reactions. The first stage is decalcification. If a mineral acid be used for this purpose, such as, an aqueous solution of 5 per cent nitric acid, the only apparent changes in a ground section are a certain amount of shrinkage and the disappearance of the translucent area. Tomes' fibre is separated from the intertubular dentine matrix by a space.

At this stage it will be seen that the line of junction is represented by a layer of tissue surrounding these spaces, which stains more strongly with basic stains than does the rest of the dentine. The second stage in the dissolution of the matrix may be brought about by warm 20 per cent hydrochloric acid on the slide. It can be shown, as was done by Churchill (1935), that only Tomes' fibre remains, although the tissue of the line of junction is very slightly more resistant to hydrolysis than the rest of the matrix. All that remains on the slide are the apparently tubular Tomes' fibres.

Kantorowicz (1911) raised the question of the relative sizes of the structures seen in ground, decalcified, and hydrolysed preparations, and maintained that the structure isolated by hydrolysis corresponded to the line of junction. This is a difficult point to investigate owing to the number of variables. It will be seen by a glance at fig. 1 that the diameters of Tomes' fibres and the lines of junction vary considerably in any given field. It is known that the diameter of Tomes' fibre varies along its length, but it is

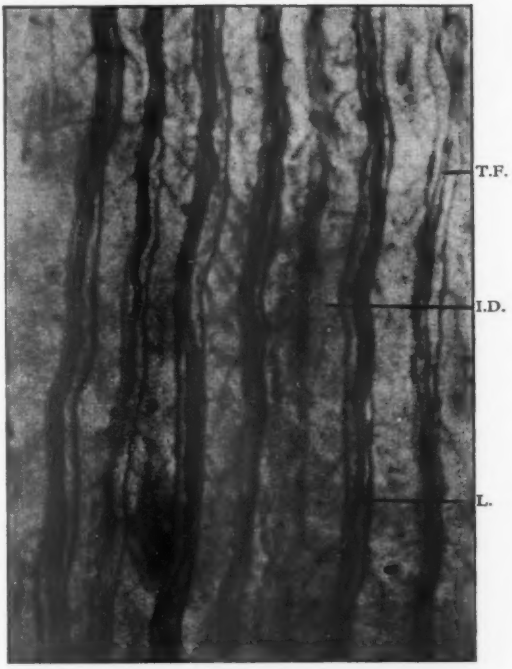

FIG. 2.—A decalcified longitudinal section of dentine, stained with toluidine blue. Mag. 1,200. Note that Tomes' fibre now lies free in a tubule bounded by the tissue of the line of junction. T.F., Tomes' fibre; I.D., Intertubular dentine matrix; L, Tissue of the line of junction.

FIG. 3.—A paraffin section of hydrolysed dentine to show Tomes' fibres. Stain hæmatoxylin. Mag. 900.

not known whether the average diameter is a constant for any one tooth, or whether it varies within the tooth, from tooth to tooth in the same subject, or from subject to subject, or during the life of the fibre. Thus although a similarity in diameter should not be taken as proof of identity, any gross discrepancy would militate against considering the various structures seen in the three types of preparations as being of similar origin. In practice, it can be observed that there is a marked similarity between the structures seen in the three types of preparation, even though the comparison is between fibres from different portions of teeth of different subjects of varying ages. Compare figs. 2, 3, 4, and 6.

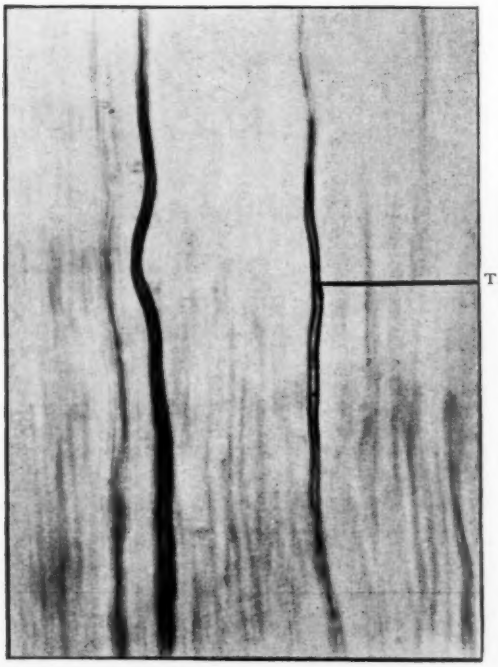

FIG. 4.—Ground longitudinal section of dentine. Stained reduced silver. Mag. 1,200. Note the differential staining of the outer layer of Tomes' fibre T.F.

The conclusion to be drawn from these observations is that the tissue isolated from dentine by hydrolysis consists of Tomes' fibre. This is the same conclusion as was reached by Hanazawa (1917) and Churchill (1935), but the researches of both these workers finished at this point, both assuming that Tomes' fibre was composed solely of the protoplasm of the odontoblast cell. In the author's opinion, a closer study of Tomes' fibre provides the clue to the whole controversy.

It was noted by Hoppe (1862) and others that structures similar to Tomes' fibres could be isolated from the teeth of prehistoric man, teeth which have been subject to putrefaction and fossilification for thousands of years. In such circumstances any normal protoplasm would disintegrate, as witnessed by the disappearance of the pulp. The same holds true for pulpless teeth, the pulps of which have either died or been extirpated after becoming infected several years prior to the extraction of the tooth. Römer's explanation of this phenomenon was that Tomes' fibre consisted of two parts:

(1) An inner portion of a soft protoplasmic nature,

(2) An outer elastic membrane which was continuous with the cell wall of the odontoblast.

Hanazawa (1917), whilst not agreeing completely with these conclusions on the nature of the

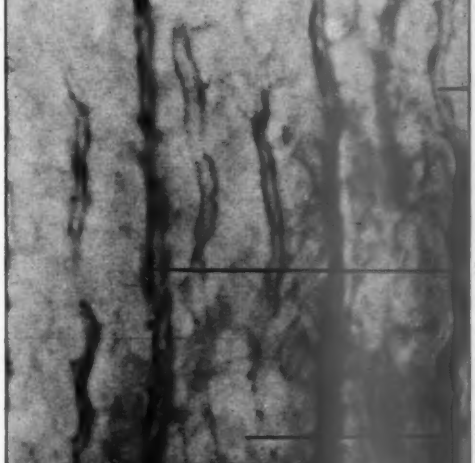

FIG. 5.—Undecalcified longitudinal section of developing dentine. Stained methylene blue (acidified) and eosin. Mag. 1,200. Note the differential staining of the outer layer of Tomes' fibre. T.F., Tomes' fibre; L, Line of junction; I.D., Intertubular dentine matrix.

outer layer of Tomes' fibre, nevertheless agrees that the fibre exhibits a differential staining, the outer layer taking nuclear stains, and the core cytoplasmic stains. This differential staining can be observed quite easily in decalcified specimens (fig. 2), but more important, it can also be observed in undecalcified sections of developing dentine (fig. 5), and in ground sections of acrylic embedded material (fig. 4).

The existence of these two layers, and the fragility of the core is well illustrated by ground sections. In ground longitudinal sections of dentine, Tomes' fibres appear to be vacuolated, one current explanation is that, owing to the undulating course of the fibre, it opens on to the surface of the section at various points, and air penetrates the "dentinal tubule." This accounts for the accepted practice of mounting ground sections in solid balsam. If, however, a whole tooth is impregnated with silver and then imbedded in acrylic resin prior to sectioning, exactly the same picture can be produced (fig. 6).

The "vacuoles" are still present, but each appears to be surrounded by reduced silver, no air can have entered the "tubules" as if these are present they have been filled with resin. It is therefore suggested that when a tooth is fixed, there is a fractioning of the peripheral portions of the protoplasm of Tomes' fibre, owing to lack of penetration of the fixative. If this disintegration of the protoplasm occurs during fixation of mature dentine, it is reasonable to suppose that the protoplasm disappears from fossil and denervated teeth. So it is concluded that the structures isolated from these teeth by hydrolysis are only the outer layers of Tomes' fibres. Indeed Bodecker (1947) came to the conclusion that the structures isolated from fresh teeth were also tubular.

Having reached the conclusion that the core of Tomes' fibre differs markedly from the periphery, it is pertinent to consider the nature and origin of the two structures. The core stains with general cytoplasmic stains, and moreover reacts positively to such special staining methods as that for the presence of phosphatase, and there can be no doubt that it is a continuation of the cytoplasm of the odontoblast cell. In contrast to the core, the outer layer stains with nuclear stains, it reduces the salts of gold and silver, and combines with the salts of the heavy metals, mercury, lead, and iron, so that these salts act as mordants. Thus any staining technique which involves the use of these salts will stain the outer layer of Tomes' fibre, such stains include hæmatoxylin of Weigert and Heidenhain, acid fuchsin of Mallory after fixation in sublimate, and metachromatic toluidine blue after fixation in basic lead acetate (Sylven, 1945).

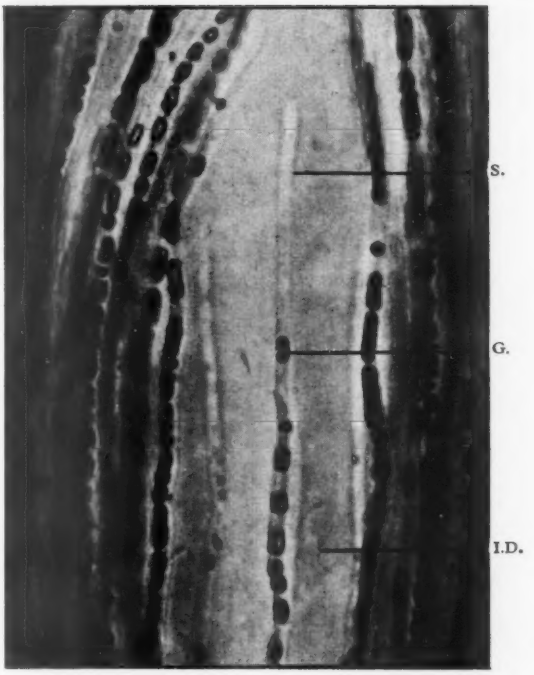

FIG. 6.—A ground longitudinal section of dentine. Stained reduced silver. Mag. 1,200. Note the fractioning of the core of Tomes' fibre, the outer layer remaining in contact with the dentine. The fact that the globules appear to overfill the sheath is probably due to spherical aberration. G, Globules of protoplasm in Tomes' fibres; S, The outer layer; I.D., Intertubular dentine matrix.

This metachromatic staining of Tomes' fibre was commented upon by Wislocki, Singer and Waldo (1948). They considered that this staining together with the ability to bind methylene blue at less than pH 3 indicated the presence of acid muco-polysaccharides. Though these workers apparently used the term "Neumann's sheath" to indicate sometimes the outer layer of Tomes' fibre and sometimes the translucent area, it can be gathered from their camera lucida drawings that they found mucoid tissue to be present in the outer layer of Tomes' fibre. These staining reactions have been confirmed (figs. 5 and 7).

On the question of the origin of this layer, it is necessary to examine the developing tooth pulp. Recent work on the structure of the young pulp describes it as consisting of cells embedded

in a soft gelatinous intracellular substance similar to that of mucoid tissue (Schour, 1932) or as possessing abundant gelatinous basophilic ground substance similar to that of mucoid tissue (Maximow and Bloom, 1942). It is not surprising therefore to find that the odontoblast cell is surrounded by a layer of mucoid tissue in the dentine as in the pulp. Wislocki *et al.* (1948) have shown that this ground substance in the pulps of teeth of young dogs exhibits the same metachromasia as Tomes' fibres in the adult, and that metachromasia of the pulp gradually decreases with age. This leads them to suggest that the property of metachromasia is associated with developing tissues. As the dentine can be considered to be in a state of constant development, it is reasonable to suppose that the mucoid tissue contained therein would remain metachromatic and basophilic for a considerable part of the life of the individual.

It has been shown (Bradford 1950) that a layer of basophilic, metachromatic tissue separates the main body of the odontoblast cell from the predentine, though the staining properties of this layer are not so marked as are those of the outer layer of Tomes' fibre. Kölliker (1852) postulated that this pulpo-dentinal membrane was continuous with the tubular structures which could be isolated by the hydrolysis of dentine. Although it would appear, as in fig. 7, that the pulpo-dentinal membrane is separated from the outer layer of Tomes' fibre by an unstained area in the predentine, this is probably due to a slight difference in chemical constitution of the outer layer of Tomes' fibre in this area. By means of suitable mordanting with iron alum prior to staining with reduced silver, it can be shown that there is actually no break in continuity.

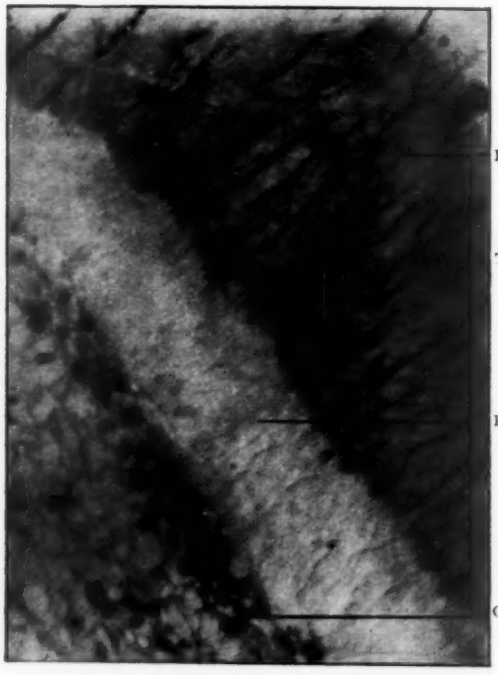

FIG. 7.—An undecalcified section of developing dentine. Stained toluidine blue after fixation in basic lead acetate. Mag. 500. Note the metachromatic staining of Tomes' fibre. I.D., Intertubular dentine; T.F., Tomes' fibre; P.D., Pre-dentine; O, Odontoblast layer.

SUMMARY AND CONCLUSIONS

The following findings, gleaned from literature, have been confirmed:

(1) The structure isolated from dentine by hydrolysis is Tomes' fibre.

(2) Similar structures may be recovered from the teeth of prehistoric man.

(3) Tomes' fibre stains differentially, the core with cytoplasmic, and the periphery with nuclear stains.

(4) The outer layer of Tomes' fibre stains metachromatically with toluidine blue after fixation in basic lead acetate, and stains with methylene blue at less than pH 3, indicating the probable presence of mucoid tissue.

To these may be added the following observations:

(5) The protoplasmic core of Tomes' fibre is very fragile and fractures soon after the extraction of the tooth.

(6) The difference between the two layers of Tomes' fibres may be seen in ground sections of acrylic embedded material, and in undecalcified sections of developing dentine.

(7) The outer layer of Tomes' fibre is continuous with the pulpo-dentinal membrane.

These observations lead to the conclusion that Tomes' fibre during life is composed of two portions, a soft cytoplasmic core which is the dentinal process of the odontoblast cell, and an outer sheath of mucoid tissue. It is this sheath which undergoes a partial hydrolysis under the action of acid causing a precipitation of protein in the form of a tube which has come to be known as the sheath of Neumann.

ACKNOWLEDGMENTS

The author is indebted to Professor G. L. Roberts, M.B., Ch.B., B.D.S. F.D.S. R.C.S., for his help and encouragement in this work, and to Mr. M. Rudland, Chief Technician to the department, for his help with the photography.

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SHORT COMMUNICATION

ABNORMAL UPPER CENTRALS

By J. W. LOWE

THE two teeth, illustrated in fig. 1, were extracted from the mouth of a boy aged 10 years. As will be seen from the model (fig. 2), these abnormal teeth occupied the position of central incisors, and the lateral incisors were erupting lingually.

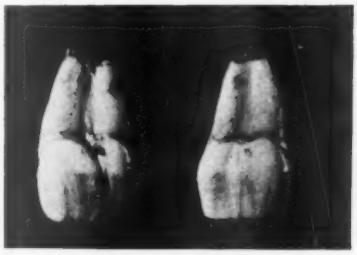

FIG. 1.

FIG. 2.

The patient has two brothers whose teeth are normal and there is no record of any similar abnormality in other members of the family.

The radiograph of the teeth (fig. 3), taken after they were extracted, reveals that the right tooth apparently has two distinct root canals whereas the left tooth has a common pulp chamber.

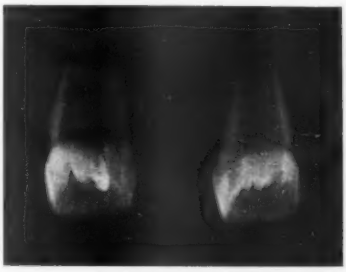

FIG. 3.

DEMONSTRATION AT ANNUAL MEETING

MALOCCLUSION: ITS ÆTIOLOGY AND PRINCIPLES OF TREATMENT

By DOUGLAS MUNNS, L.D.S. Eng.

THIS demonstration, which was presented by the members of the teaching staff of the Royal Dental Hospital of London School of Dental Surgery (University of London), was an attempt to present the various aspects of malocclusion as they present themselves in our surgeries. It was assumed that ideal normal occlusion included the following factors and that malocclusion may result if one or more of them are absent:

(1) Healthy teeth in healthy tissues—each tooth in good function ;
(2) contour of each individual tooth maintained—correct contact between each tooth in each arch—good alignment of each arch ;
(3) correct relationship between two perfectly balanced arches ;
(4) full excursion of mandible with balanced contacts ;
(5) normal temporomandibular articulation.

The demonstration was presented under three main sections which, together with their subdivisions, were as follows :

Ætiology

(1) Untreated malalignment of teeth and arches in childhood.

(2) Mal-alignment of teeth and arches (resulting in parodontal disease).
(3) Non-replacement of extracted teeth.
(4) Poor contouring of occlusal restorations.
(5) Ill-fitting dentures.
(6) Traumatic habits.

FIG. 1.—Loss of tooth substance as result of traumatic habit following early loss of deciduous posterior teeth.

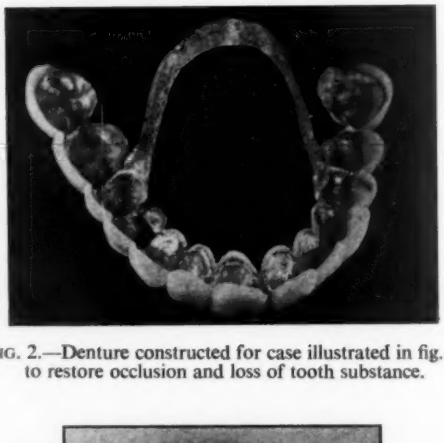

FIG. 2.—Denture constructed for case illustrated in fig. 1 to restore occlusion and loss of tooth substance.

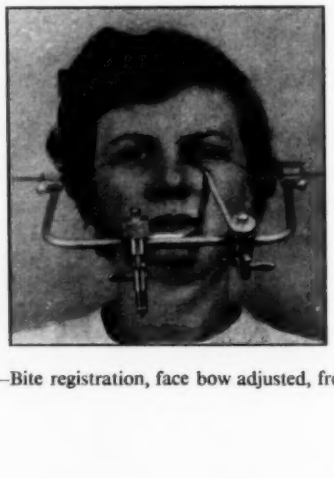

FIG. 3.—Bite registration, face bow adjusted, front view.

Diagnosis and Treatment Planning

(1) Examination of patient, illustrating the main points to be noted in the examination of any patient.
(2) Bite registration, illustrating face bow technique for articulating models of full or partial dentition on adjustable articulator.

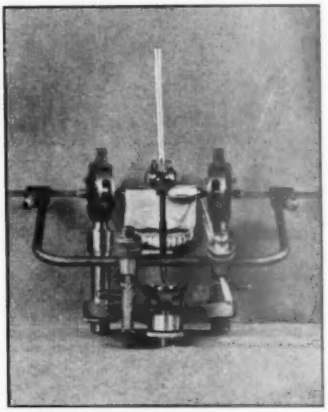

FIG. 4.—Bite registration. Upper model positioned on adjustable articulator.

Principles of Treatment

(1) Occlusal adjustment—spot grinding.
(2) Onlays—details of construction.
(3) Inlays and bridges—details of construction.
(4) Bite splints—details of construction.
(5) Adult orthodontics.

There was also a final section in which a number of cases of interest were shown, each case illustrating an important aspect of treatment, some showing the

FIG. 5.—Upper denture to restore normal occlusion. 321 | 12 fitted over worn natural teeth, onlays on 6 | 5.

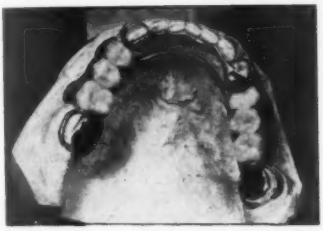

FIG. 6.—Lower denture to restore normal occlusion, onlays on $\overline{8|7}$.

value of a combination of more than one method outlined above.

Each section was fully illustrated with photographs, models, diagrams, colour transparencies, radiographs, etc. ; although it is not possible to reproduce all these, I am indebted to the Dean of the Royal Dental Hospital of London for permission to reproduce the accompanying selection of photographs, all of which were produced in the department of Clinical Photography and Visual Education.

BRITISH DENTAL JOURNAL

NOVEMBER 7, 1950

THE NEW ZEALAND REPORT

THE Report of the Mission to New Zealand,[1] which was appointed "to obtain first-hand information as to the work and training of New Zealand School Dental Nurses," is almost wholly confined to a factual statement dealing with the inception, development and organisation of the Service and the results which have been achieved under it. In this respect the Report adds little to what was already familiar to those who have studied the numerous articles on the Service published in recent years. The facts, however, are marshalled in a form which should make it easy for anyone not already conversant with them, to obtain a complete picture of the manner in which the scheme works and of its steady development during the twenty-nine years which have elapsed since it was inaugurated on the advice, and under the direction, of Mr. (now Sir) Thomas A. Hunter.

Two points of cardinal importance emerge from this review : the reaction of the profession in New Zealand to the scheme, and the strict limitation of the number of school children for whom each dental nurse was to be responsible in order to ensure that each of the children would be examined once every six months and be given complete treatment. It is hardly surprising to learn that the original proposal was received with mixed feelings by the profession in New Zealand. It nevertheless received the approval of the New Zealand DentalAssociation, and the Mission record that, after meeting the Council of the Association and many individual members of the profession, they "were left in no doubt that the scheme has the full support of the profession." They, wisely, add in their conclusions that, if it should be decided to adopt a similar scheme or some modification of it in this country, it would be important to secure the fullest co-operation of the profession. On the point of limitation of numbers, it is instructive to note that, although in the first years of the Service only thirty dental nurses were trained, Hunter was insistent that each of them should limit her work to 750 children, a figure subsequently reduced to 500. That the principle underlying this limitation of numbers is sound, is hardly open to debate, but it can readily be appreciated that lay authorities might not always easily be persuaded to take such a far-sighted view and be prepared to neglect one or more sections of the population in order that complete treatment might be given to a selected few. Yet such a course is at once the most scientific way of attacking the problem and, in the long run, the least expensive, both in terms of money and man-power. A logical development of this plan is that children who fail to keep two successive appointments are excluded from the scheme until such time as they have been rendered dentally fit by private practitioners at the parents' expense.

The School Service having been built up in this way, a Service for adolescents is now being established, and it is interesting to note that, for the time being, the upper age limit applicable to this latter scheme has been fixed at the low age of 16, the intention doubtless being to follow the same general plan of gradual development as was adopted in the School Service.

[1] New Zealand School Dental Nurses. Report of United Kingdom Dental Mission. H.M. Stationery Office, 1s. 3d. net.

It is also of interest to note that in areas having a children-nurse ratio higher than 500 : 1 children in the higher age groups are passed to the adolescent scheme. This, however, is only a temporary expedient adopted to bridge the interval before sufficient nurses can be trained to deal with the rapidly increasing school population. The treatment of adolescents is ultimately to be given by salaried dental officers but, for the time being, this scheme is, for the most part, being carried out by private practitioners on a fee-for-service basis.

It is interesting to learn from the section of the Report dealing with the training of the school dental nurses that this was deliberately divorced from that of the undergraduate dental student and made a direct responsibility of the Department of Health. The aim has been to emphasise that the dental nurses are auxiliaries and to foster a high esprit de corps among them, and it is worthy of note that there has not been a single complaint of illegal practice by a dental nurse. The work of the nurses in the field is supervised by dental officers and dental nurse inspectors. Each of the six Principal Dental Officers is responsible for the work of 80 dental nurses. He visits each of these once in each term, and makes a detailed report on her clinical work and the organisation of the clinic, and is available for consultation at other times. It is clear that working under such a system, the dental nurses carry considerable responsibility, but the Mission was satisfied that the system of training " has resulted in a high standard of technical efficiency in the treatment of children within the limits laid down." In this connection, it has to be remembered that the nurses are limited to the treatment of " enrolled children " who are examined every six months. The Report contains a series of figures of the work carried out by dental nurses. These show that, broadly speaking, the ratio of fillings to extractions is 100 : 6·12, and the Mission record that they found that very few children had lost deciduous teeth prematurely. The cost of providing treatment on this scale works out at slightly in excess of 19s. per annum for each child treated, exclusive of the costs of training and other capital charges. If these are included, the total cost is £1 8s. 11d. One not unimportant factor is the wastage, mainly due to marriage, in the number of school nurses.

Even a brief summary of the Report would be seriously incomplete if no mention was made of the work of the dental nurses in dental health education. Preparation for this work forms an integral part of their training, and it is clear that the members of the Mission were impressed by the keenness of the nurses in this respect, and of their ability to promote a high standard of oral hygiene among the children for whom they were responsible.

Another interesting feature of the organisation of the Service is the School Dental Clinic Committee, a local committee which is responsible for the upkeep of the clinic and for ensuring that the nurse has suitable lodgings. This arrangement gives each locality a special interest in the work, and has obviously much to commend it, especially in a country with so many small communities scattered over a wide area.

That the scheme has been successful in New Zealand is no longer open to doubt. Nor can it be questioned that it has met a need which probably could not have been met so adequately in any more orthodox way. It has been developed on a systematic plan over a period of nearly thirty years and, throughout, the aim of ensuring that every child treated should be made and kept dentally fit has been kept steadily in view. Although the Mission very properly refrain from expressing their own opinions on them, the questions posed by the Report are obvious. Would the New Zealand scheme, or any modification of it, be equally successful in this country? And, to return to an earlier point, would the dental profession be prepared to co-operate in putting such a scheme into operation?

NOTES AND COMMENTS

The Proposed General Dental Services Committee

THE proposal that a General Dental Services Committee consisting of representatives appointed by the British Dental Association together with representatives elected by Local Dental Committees formed the main item in the long agenda considered at the recent meeting of the Representative Board. The Board had before it the report of the Conference between the Council and representatives of Local Dental Committees and the replies which had been received from some of the latter to the letter which had circulated to the committees with the report of the Conference. During the long discussion it became evident that there was a general desire among the members of the Association for fuller information with regard to the constitution of the proposed committee and its relation to the Representative Board, and as to the reactions of Local Dental Committees to the tentative proposals adopted by the Conference. This feeling was crystallised in

a series of resolutions postponing further consideration of the matter until the meeting of the Board in January, requesting the Branches to hold meetings to discuss the proposals and inviting the observations of those Local Dental Committees, some 140 in number, who had not already made any comment on report of the Conference. The adoption of this procedure should enable the Board to take up the discussion of the proposals in January with a full appreciation of the trend of opinion throughout the profession.

Presentation Portrait of Dr. Lindsay

DR. LILIAN LINDSAY'S self-sacrificing labours on behalf of the profession, in particular in the realm of dental literature, old and new, have earned her such a special place in the esteem and affection of members of the profession that it is a work of supererogation to commend to readers of the Journal the appeal, which will be found in this issue, for subscriptions to a fund which is being raised to celebrate her eightieth birthday by presenting her with her portrait.

Presentation to Mr. Lionel Balding

MANY members of the Association may be unaware that in addition to the work Mr. Lionel Balding has done on behalf of the Association generally, he has also been Honorary Secretary of the Southern Counties Branch, He recently retired from that office after thirteen years' service. Members of the Branch have always greatly appreciated the fact that, in spite of his many other duties, he has always found time to look after their affairs with great efficiency and to give counsel and advice on their own individual problems. At the Annual General Meeting of the Branch on October 7 they took the opportunity of showing their appreciation of his work and the esteem in which he is held by making a gift to Mrs. Balding and by presenting him with a cheque for £406.

Letter to the Editor

PRESENTATION PORTRAIT OF DR. LINDSAY

SIR,—Dr. Lilian Lindsay will attain her eightieth birthday next year, and some of her friends have suggested that it would be appropriate to mark the occasion by presenting her with her portrait.

It is felt that, quite apart from the wish to do honour to Dr. Lindsay, it is desirable that there should be in existence a portrait by an eminent contemporary artist of one who occupies a unique place in the history of the profession.

The proposal having been approved by the Council of the Association, we have great pleasure in commending it to Dr. Lindsay's many friends and admirers in the profession.

Mr. W. Shearer has kindly undertaken to act as treasurer to the fund which is being raised, and subscriptions should be sent to him at 62, Oxford Street, Wellingborough, Northants. Envelopes should be marked "Lindsay Portrait."

Yoursfaithfully,

H. T. ROPER HALL (*President*).
E. B. DOWSETT.
W. KELSEY FRY.
THOMAS HINDLE.
A. P. HUSBAND.
J. LAUER.
W. R. TATTERSALL.
BRYAN J. WOOD (*Chairman of the Committee*).

METROPOLITAN BRANCH STUDY CIRCLE

(1) "**Periodontia**."—A course of six lectures is being given by Mr. A. B. Wade, on Tuesdays at 7.15 p.m. at the British Dental Association, 13 Hill Street, Berkeley Square, W.1, starting on January 9, 1951.

The course is limited to six members. Fee two guineas.

(2) "**Anterior Bridgework**."—A practical course of six sessions is being given by Mr. G. A. Morrant, on Mondays at 7.15 p.m. at the Eastman Dental Clinic, Gray's Inn Road, W.C.1, starting on February 5, 1951.

The course is limited to six members. Fee three guineas, which does not include the provision of such gold as may be required.

Application for both courses should be made to Mr. A. C. Mack, 11, Castlebar Road, London, W.5.

CANDIDATES FOR MEMBERSHIP

(E.C.) BENNETT, Philip Offord, B.D.S.Lond., L.D.S.Eng., 82, Dorset Avenue, Romford, Essex.
Nominated by : A. E. W. Miles, G. T. Hankey, N. L. Ward.

(W.L.) BRACEWELL, Ronald Ernest, L.D.S.Lpool, 24, Portland Street, Southport, Lancs.
Nominated by : F. E. Lawton, G. E. Myers, Miss J. M. Andrews.

(W.L.) BRAYSHAW, Squire Barlow, L.D.S.Lpool, 6, Bickerton Road, Southport, Lancs.
Nominated by : G. V. Watt, F. E. Lawton, G. E. Myers.

(C.C.) BRYER, Lionel Walter, B.D.S.Witwatersrand, University College, Oxford.
Nominated by : D. Davy, S. B. Allard, W. B. Lloyd.

(E.M.) CROOK, James, Dentists Act, 33, Normanton Road, Derby.
Nominated by : P. R. Cullin, G. A. Hunt, G. F. Finlow, J. S. Lowe, J. A. T. Rowlett.

(N.C.) DALE, Gerald Ian, L.D.S.Durh., 38, Beaconsfield Street, Blyth, Northumberland.
Nominated by : Professor R. Bradlaw, Professor J. Boyes, Professor R. W. Lovel.

(S.W.) DAVIS, Kenneth Harold, L.D.S.Manc., 73, Nethercliffe Avenue, Netherlee, Glasgow, S.4.
Nominated by : G. B. F. Patterson, D. Mason, A. A. Blake.

(S.C.) FRANCIS, Ronald Charles, L.D.S.Eng., 249, Limpsfield Road, Warlingham, Surrey.
Nominated by : C. T. Francis, G. F. Dyer, R. Gain.

(W.L.) GILLOW, Marjorie Ruth (Miss), L.D.S.Lpool, Laund House, College Avenue, Formby, Lancs.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(W.L.) GREEN, Alan Gordon, L.D.S.Lpool, The Hollies, Roby Road, Huyton, Near Liverpool.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(W.C.) HOWELL, Leslie Benjamin, L.D.S.Brist., 3, King Square, Bridgwater, Somerset.
Nominated by : F. R. Hogbin, L. E. Claremont, H. Hazel.

(E.C.) KING, Eric John Ferguson, L.D.S.Eng., 40, North Hill, Colchester, Essex.
Nominated by : L. G. Spiller, A. J. H. Seymour, R. G. J. Tovey.

(W.L.) KRAMER, Louis Deyong, B.D.S.Lpool, 31, Rossett Avenue, Liverpool, 17.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(N.I.) LITTLE, Edward Joseph, B.D.S.Irel., 209, Donegall Street, Belfast.
Nominated by : T. J. Gilmore, D. J. Keane, M. F. McGlade.

(W.L.) LONG, Ivan Hollis, B.D.S.Lpool, 22, Sandy Lane, Wallasey, Cheshire.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(N.C.) McKAY, Harold Vernon, L.D.S.Glasg., Chester House, Haltwhistle, Northumberland.
Nominated by : J. W. P. Robinson, J. Chalmers, H. Davis.

(W.L.) MELVILLE, William James, L.D.S.Lpool, 91, Abbey Road, Barrow-in-Furness.
Nominated by : H. Cockbaine, A. B. Ellis, J. H. Davies.

(M.) MORGAN, Evan Dennis, L.D.S.Eng., 299, Brownhall Road, London, S.E.6.
Nominated by : J. B. Kirkwood, A. A. Leigh, H. C. Tippett.

(W.C.) MORGAN, Francis Edward, Dentists Act, Holly Lodge, Tiverton, Devon.
Nominated by : A. F. Lavelle, E. R. Foley, R. F. Mawson, V. R. Roberts.

(N.S.) OLIVER, William Montgomerie, L.D.S.St.And., 127, Ferry Road, Dundee, Angus.
Nominated by : W. J. Reid, J. L. Milne, D. A. Henderson.

(W.C.) PENGELLY, John Patrick Blessley, L.D.S.Brist., 157, Wells Road, Bristol.
Nominated by : Professor A. I. Darling, J. R. Timms, F. R. Hogbin.

(S.C.) ROBERTS, Gerald Holgate, B.Ch.D.Leeds., Longreach, Courtlodge Road, Trottiscliffe, Near West Malling, Kent.
Nominated by : H. R. Doelly, A. B. Wade, J. D. McEwen, P. M. C. James.

(S.C.) SCHOVE, Joyce Winifred (Miss), L.D.S.Lpool, Oak Lodge, 53, Beckenham Road, West Wickham, Kent.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(S.C.) SHAW, John Donald Russell, B.D.S.Lond., 50, First Avenue, Hove, Sussex.
Nominated by : R. J. Hooker, S. B. Taylor, L. E. Balding.

(E.C.) SMITH, Doris Edith (Miss), B.D.S.Lond., L.D.S.Eng., 34, Central Avenue, Hounslow, Middlesex.
Nominated by : D. Munns, R. R. Stephens, Mrs. E. G. Lindon.

(W.L.) SMITH, Ian Donald James, L.D.S.Edin., School Dental Clinic, Thurnham House, Thurnham Street, Lancaster.
Nominated by : J. W. Sandham, E. H. Seabury, J. M. Millett.

(S.C.) SUMNER, Frederick James, Dentists Act, 116, Canterbury Road, Margate, Kent.
Nominated by : S. W. Ingram, J. Morris-Wilson, J. B. Reed.

(E.C.) TERRY, Maurice Edmund, L.D.S.Birm., Bayley, Western Road, Tring, Herts.
Nominated by : J. C. L. Phillips, J. L. Hardwick, J. Kitchen.

(W.L.) WARWICK, Rita Mary (Miss), B.D.S.Lpool, Seafield, Jubilee Road, Formby, Liverpool, Lancs.
Nominated by : J. M. Mumford, F. E. Lawton, G. E. Myers.

(N.C.) WEALTHALL, Maurice, L.D.S.Durh., 24, Earls Drive, Denton, Newcastle-on-Tyne, 5.
Nominated by : Professor R. Bradlaw, Professor J. Boyes, Professor R. W. Lovel.

(W.L.) WHITEHEAD, Geoffrey Ralph Roland, L.D.S.Eng., L.D.S.Lpool, 6, Waterloo Road, Ramsey, Isle of Man.
Nominated by : G. E. Myers, J. M. Mumford, F. E. Lawton.

(E.C.) WILLIAMS, Kenneth Vaughan, B.D.S.Lond, L.D.S. Eng., 6, Claremont Gardens, Upminster, Essex.
Nominated by : G. T. Hankey, A. K. I. Jones, B. Matthews.

(E.C.) WOODGER, Eric Ashdown, L.D.S.Eng., 9, Barnfield Avenue, Luton, Beds.
Nominated by : W. B. Balderston, Miss J. Brown, A. D. E. Shefford.

Candidates for Readmission

(W.C.) MOGG, Ernest Willey, L.D.S.Brist., 57, Esplanade, Fowley, Cornwall.
Nominated by : L. W. G. Jones, N. H. Simmonds, F. R. Hogbin.

(—) VICKERS, Anthony Rossington, L.D.S.Edin., Exporters House, Suleman Street, Dar es Salaam, Tanganyika.
Nominated by : R. L. K. Common, R. H. K. Common, D. M. S. Dick.

Our Diary

Thursday, November 9.

Liverpool University Dental Students' Society.—Annual Dental Ball, The Students' Union, Bedford Street, Liverpool.

Metropolitan Branch.—Dinner Dance and Cabaret, Savoy Hotel, 7 for 7.30 p.m.

Brighton and District Section.—Conjoint Meeting with the B.M.A. (Brighton Division), "The Dudley Hotel," Lansdowne Place, Hove, 8 p.m. "Anæsthesia," Dr. J. H. Challis.

University College Hospital Dental Society.—Medical School, University College Hospital, Gower Street, London, W.1, 7.30 p.m. "Jaw Fracture Treatment," G. J. Parfitt.

Friday, November 10.

West of Scotland Branch.—Annual Dinner and Dance, Central Station Hotel, Glasgow, 7 for 7.30 p.m.

Saturday, November 11.

West Lancashire, West Cheshire and North Wales Branch.—Imperial Hotel, Llandudno, 2.30 p.m. "The Dental Treatment of the Rheumatic Patient," W. Peebles.

Monday, November 13.

The British Society for the Study of Orthodontics.—Manson House, 26, Portland Place, London, W.1, 7.30 p.m. "The Human Jaws and Dentition," Professor F. Wood Jones.

Tuesday, November 14.

Bristol and District Section.—The Dental Hospital, Bristol, 7.30 p.m. "The Relationship of Dental Sepsis and Pulmonary Suppuration," R. H. R. Belsey.

Wolverhampton and District Section.—Annual Dinner, Star and Garter Royal Hotel, Wolverhampton, 7.30 for 8 p.m., preceded by Annual Business Meeting, 7 p.m.

Wednesday, November 15.

Central Counties Branch.—Medical Institute, Birmingham, 3 p.m. "Some Psychiatric Aspects of Dentistry," Dr. E. S. Stern.

Thursday, November 16.

Bournemouth and District Section.—The Grand Hotel, Fir Vale Road, Bournemouth, 8 p.m., preceded by Informal Dinner, 6.30 for 7 p.m. "Fillings—Fallacies and Practical Procedures," Warren Harvey.

Leeds and District Section.—Leeds School of Dentistry, 7.45 p.m. "Aspects of Oral Surgery," Professor T. Talmage Read.

Friday, November 17.

Guy's Hospital Dental Society.—Annual Ball, Grosvenor House, Park Lane, W.1, 8 p.m. to 1 a.m.

Saturday, November 18.

Public Dental Officers' Group.—University Arms Hotel, Cambridge. 10 a.m.: Films of dental and scientific interest. 2.30 p.m.: Annual Meeting. 7 for 7.30 p.m.: Annual Dinner.

Monday, November 20.

Oxford Section.—Radcliffe Infirmary Committee Room, 8 p.m. "The Practitioner—R.D.O. Relationship," P. A. Crow.

Friday, November 24.

West Kent Section.—Wrotham Park Club. Dinner, 7.30 p.m. "Impression Technique: Kostecka's Operation" (Lantern Slides), Professor H. R. B. Fenn.

Saturday, November 25.

The Continental Dental Society.—Eastman Dental Clinic, Gray's Inn Road, London, W.C.1. 10 a.m., Papers; 2 p.m., Papers; 4 p.m., Table Demonstrations.

The Royal Dental Hospital of London School of Dental Surgery.—Annual Clinical "At Home," Royal Dental Hospital, 3 p.m. Annual Dinner, Savoy Hotel, 7 for 7.30 p.m.

Monday, November 27.

The Royal Society of Medicine—Section of Odontology.—1, Wimpole Street, London, W.1, 5.30 p.m. "Enamel Lamellæ in Relation to Dental Caries," Professor E. B. Manley and J. L. Hardwick.

Tuesday, November 28.

The Institute of British Surgical Technicians—Dental Section.—Lecture, St. Ermin's, Caxton Street, London, S.W.1, 6.30 p.m. "Partial Dentures," Professor J. Osborne.

FORTHCOMING MEETINGS AT HEADQUARTERS

November 10	Finance Committee...	5 p.m.
November 14	Grant-in-Aid Committee	7 p.m.
November 17	Executive Committee	7.30 p.m.
November 18	Council	10 a.m.
November 24	Ancillary Dental Workers Committee	2.30 p.m.
November 25	Remuneration Committee	10.30 a.m.

It is regretted that, although normal working was resumed in the printing trade last week, it has been possible to produce only an abbreviated issue. The report of the meeting of the Representative Board and much other matter which it has been impossible to print in time for this issue will appear in the Journal of November 21.

ASSOCIATION NOTICES

BRITISH DENTAL ASSOCIATION

13, Hill Street, Berkeley Square, London, W.1.
Telegrams: "Bridention," Audley, London.
Telephone Nos.: Grosvenor 1592, 1593.
Journal Office: **Grosvenor 2761.**

XI INTERNATIONAL DENTAL CONGRESS
GROsvenor 3020

Dentists' Provident Society and Dentists' Insurance Committee. Telephone No.: Grosvenor 1173.